DOCUMENT RESUME

ED 447 427 CS 014 121

TITLE	Fast ForWord.
INSTITUTION	Education Commission of the States, Denver, CO.
PUB DATE	1999-00-00
NOTE	7p.
AVAILABLE FROM	Education Commission of the States, 707 17th St., #2700, Denver, CO 80202-3427. Tel: 303-299-3600; Web site: http://www.ecs.org.
PUB TYPE	Information Analyses (070) -- Reports - Descriptive (141)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Elementary Education; High Risk Students; *Instructional Effectiveness; Instructional Materials; Internet; Preschool Education; *Program Content; Program Descriptions; Reading Difficulties; *Reading Instruction; *Reading Programs; Reading Research; *Remedial Reading
IDENTIFIERS	*Fast ForWord

ABSTRACT

This paper provides an overview of Fast ForWord, a CD-ROM and Internet-based training program for children (pre-K to grade 8) with language and reading problems that helps children rapidly build oral language comprehension and other critical skills necessary for learning to read or becoming a better reader. With the help of computers, speech sounds can be altered, reproduced, and eventually differentiated by children with language difficulties. Using this technology in an intensive, adaptive training program, students can develop a wide range of critical language skills such as phonemic awareness, auditory processing speed, phonological awareness, working memory, syntax, grammar, sequencing, and other necessary reading skills. Key components of Fast ForWord include seven training exercises, an Internet-based performance review, and Scientific Learning's Web site. Sections of the paper discuss background, philosophy and goals, program components, evidence of effectiveness, professional development and support, implementation, costs, considerations, contact information, and policy issues and questions. (SR)

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Fast ForWord

**Background - Philosophy and Goals - Program Components - Evidence of Effectiveness
Professional Development and Support - Implementation - Costs - Considerations
Policy Issues and Questions - Resources**

Topic or Category: Reading
Grade Level: Pre-K to 8th
Target Population: General, At Risk

OVERVIEW

Background and Scope:

Fast ForWord is a CD-ROM and Internet-based training program that helps children rapidly build oral language comprehension and other critical skills necessary for learning to read or becoming a better reader.

Fast ForWord evolved from the work of noted research scientists Michael Merzenich and Bill Jenkins from the University of California at San Francisco, and Paula Tallal and Steven Miller, experts on the neurological basis of language at Rutgers University.

Merzenich and Jenkins are internationally known for their research in the science of *brain plasticity*, which is the concept that the brain changes as people learn new skills. Brain plasticity has been instrumental in understanding improved learning strategies for children with language and reading problems -- specifically, that adaptive training techniques such as frequency, reward, intensity and motivation allow for more rapid learning.

The collaboration of Merzenich, Jenkins, Tallal and Miller resulted in a key finding: With the help of computers, speech sounds can be altered, reproduced and eventually differentiated by children with language difficulties. Using this technology in an intensive, adaptive training program, or *optimal learning environment*, the scientists discovered that students can develop a wide range of critical language skills such as phonemic awareness, auditory processing speed, phonological awareness, working memory, syntax, grammar, sequencing and other necessary reading skills.

To date, more than 400 school districts have implemented Fast ForWord to help students with language and reading problems.

Fast ForWord is part of Scientific Learning's complete, multi-year approach to helping students who are at risk for academic problems. For more information on other programs, please contact the developer.

Philosophy and Goals:

The primary goal of Fast ForWord is to create advanced training programs for individuals with language and reading problems.

Program Components:

The key components of Fast ForWord include the following:
Seven Training Exercises
Fast ForWord includes seven training exercises presented in a game-like environment. The exercises use

five or more levels of acoustically modified speech. Sounds are stretched and emphasized in the lowest levels, and progress to natural speech at the highest level. The exercises are designed to help children recognize word sounds -- first, in isolation, then in groups of sounds, words and, finally, sentences. The exercise schedule is intense -- 100 minutes per day, five days per week, for four to eight weeks.

Internet-based Performance Review
Another critical component of the Fast ForWord training program is an Internet-based performance review program called SLc Lesson. At the end of each day, each student's training data (responses to Fast ForWord trials) are uploaded to Scientific Learning's database using the Internet. Using SLc Lesson, teachers and speech and language professionals can retrieve this data and review, in detail and summary form, each student's progress in each of the Fast ForWord training exercises. Graphical and textual reports created with SLc Lesson can be shared with the student, parents, fellow teachers, or school and district administrators.

Scientific Learning Web Site
Scientific Learning's Web site (www.scientificlearning.com) offers parents, educators and other learning facilitators a wide variety of information and forums to exchange ideas on Fast ForWord, as well as how language and reading are learned.

Evidence of Effectiveness:

Summary of Evidence
Studies indicate that students trained with Fast ForWord make, an average, one to two years gains after four to eight weeks of training.

Evaluations/Studies
Initial Clinical Study
In 1994 and 1995, founding Scientific Learning scientists from the University of California San Francisco (UCSF) and Rutgers University conducted initial controlled studies to measure the effectiveness of the technology, methods and applications that formed the basis of Fast ForWord. Their clinical results, published in the January 1996 issue of the peer-reviewed journal *Science*, demonstrated rapidly improved language skills, including auditory processing speed, speech discrimination, phonemic and phonological awareness, grammatical and syntactic comprehension, overall language comprehension, and other receptive and expressive language skills.

National Field Trial
In 1996, the National Field Trial was conducted in collaboration with more than 60 independent professionals at 35 sites across the United States and Canada. An important objective of the study was to confirm that Fast ForWord would be successful outside of the laboratory in real-world settings. At each site, independent speech and language professionals and other education professionals selected students 4-14 years old, who exhibited difficulties with either listening or language comprehension skills. These professionals administered the Fast ForWord program to the children in a conventional clinic, private practice, school or home setting.
Each of the 35 sites reported conclusive validation of Fast ForWord's effectiveness.
Ninety percent of the students who participated in the Field Trial achieved significant gains in one or more tested areas.
Most students made statistically significant gains in multiple tested areas, including improvements in auditory word discrimination, the ability to follow spoken directions, listening and speaking fundamentals, auditory processing speed, speech discrimination, language processing, grammatical comprehension and overall language comprehension. The results included:
Auditory Word Discrimination: The Goldman Fristoe Woodcock Test of Auditory Discrimination measures a child's ability to discriminate between similar sounding words in both quiet and noisy situations. Overall, children in the study demonstrated significant gains in these abilities following Fast ForWord training. Following the training, the percentage of the children scoring at or above the level expected for their age rose from 7% to 39%.
Following Directions: The Token Test for Children measures a child's ability to follow spoken directions. Prior to Fast ForWord training, the children's ability to follow spoken directions was well

below average -- almost two standard deviations below the mean for the test. After training, the children's ability moved from below average to average, with an average gain of over one standard deviation on the Token Test.
Overall Language Development (1): The Clinical Evaluation of Language Fundamentals (CELF-3) is a comprehensive test that measures a wide range of receptive and expressive language skills, including a child's ability to understand spoken words and sentences, follow directions, recall and formulate sentences, and understand relationships between words and categories. After Fast ForWord training, the percentage of children scoring at or above the standard mean on expressive tests rose from 5% to 20%; on the receptive tests, the percentage was raised from 7% to 27%.
Overall Language Development (2): The Test of Language Development, Primary, is a comprehensive test that measures a child's ability to combine sentences, understand work meanings and sentence structures, and make generalizations. Prior to training, only 15% scored at or above the standard mean. This improved to 42% following the training.

School Pilot Study
In fall 1997, Scientific Learning conducted the School Pilot Study in collaboration with nine school districts in California, Texas, Illinois, Indiana and Nebraska. The goal of this study, which included more than 400 students, was to determine the efficacy of Fast ForWord training for students at risk for failure in reading and language skills. Kindergarten-3rd grade classroom teachers at each participating district identified students at risk for failure in reading or language arts. These students were randomly assigned to an experimental group that trained with Fast ForWord and a comparison group (matched to the experimental group for age and gender) that remained in their regular classroom program and did not train with Fast ForWord.

The following tests were used to evaluate the effectiveness of the training program:
(a) Test of Auditory Comprehension of Language, which examines comprehension for spoken language
(b) Phonological Awareness Test, which is designed to assess phonological processing abilities. Two of the eight subtests were administered. The Isolation subtest measures a child's ability to identify the initial, medial or final sound in a spoken word; the Deletion subtest measures a child's ability to delete specific sound parts.

The study revealed the following results:
Prior to training, the language comprehension performance for both the control group and the group using Fast ForWord was well below average, approximately the 12.5 percentile for normal distribution, a finding consistent with the at-risk status assigned by their classroom teachers. At post-testing, control-group performance had improved to the 21st percentile, while the training group improved to the 49th percentile.
The number of children performing at or above the median in age-corrected language comprehension performance improved for the trained group from 11.3% to 39.3% as compared to 11.9% to 14.8% for the control group.
Significant gains in language comprehension performance were identified for 71% of individuals that received the speech and language training with an average improvement of 1.8 years. This is significantly larger than would be expected by chance or that was observed in the control group.
About 75% of children who received training were effectively removed from the "at-risk" category. Further, positive behavioral changes in attention, cognitive flexibility and distractibility paralleled these language advances.

Impact on Parents/Community
Parents serve two primary roles in Fast ForWord implementation:
Selection of appropriate student for participation: Parents can provide important information on behavior and development to help school officials determine if Fast ForWord is an appropriate program for their child. Scientific Learning provides schools with parent behavior questionnaires to facilitate the collection of this information from parents.
Ensuring compliance with the Fast ForWord training protocol: To achieve maximum success with the Fast ForWord program, students must comply with the rigorous 100 minutes per day, five days per week training schedule for four to eight weeks. Parents can help students comply with the training program by minimizing absences and helping students stay motivated to train.

Professional Development and Support:

Professional development and ongoing support are critical components of the Fast ForWord program. Fast ForWord professional development seminars offer practical implementation guidance supported by detailed information about the research and principles behind the program. Educators learn about current and established findings on how phonemic awareness, neuroscience, neuropsychology and acoustic properties of speech impact rapid development of language and reading skills.

The seminars cover reporting and outcome strategies, with special attention to student evaluation and selecting candidates for Fast ForWord training. Other topics addressed in Fast ForWord professional development seminars include the following:
The current and established research describing the role phonemic awareness and phonological awareness play in learning to read
The current neuroscience research, including discoveries in brain plasticity and its implications for improved teaching
The scientific background and field trial results validating the efficiency of Fast ForWord training for students with language and reading problems
The methods for assessment of Fast ForWord candidates and selection of appropriate standardized language measures for testing and evaluation
Effective means of implementation, ensuring the best environment for compliance from students, parents and staff
How to summarize student results for parents and staff and integrate that data into current teaching and training
How to interpret SLc Lesson, the Fast ForWord management reports based on student performance
How to determine the progress and gains students achieve after Fast ForWord training.

Implementation:

The Fast ForWord training schedule consists of five 20-minute exercises per day (100 minutes), five days per week, for four to eight weeks. Schools have successfully implemented Fast ForWord as a pull-out program (especially appropriate when language difficulties prevent students from understanding much of the instruction during the day), a before- and after-school program (most appropriate for schools that have extended-day programs or another previously determined way to solve transportation issues), or some combination of the two. Scientific Learning Corporation has developed a *School Implementation Guide* that provides implementation options for Fast ForWord.

Costs:

Estimated costs for 50 students are $38,250, based on 1999 figures. This cost covers 50 Fast ForWord training programs; Fast ForWord training seminar on site for up to 40 district professionals; onsite software installation and setup by Scientific Learning technical professionals; and unlimited toll-free access to customer service and technical support staff, available six days a week.

Considerations:

Scientific Learning Corporation has amassed an impressive array of research data, case studies and anecdotal information related to Fast ForWord's success in helping a broad population of children with reading and language problems. Other considerations might include the following: (1) cost ($38,250 for 50 students, based on 1999 figures, and not including any technology upgrades that may be needed); (2) technology (specific technical requirements for computer and network equipment necessary to run the Fast ForWord program); (3) commitment (students are required to train on Fast ForWord for 100 minutes a day, five days a week, for up to eight weeks); and (4) sharing success (districts are asked to share their experiences with other schools and the media).

Contact Information:
For more information about Fast ForWord, please contact:

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Policy Issues and Questions:
How can states help districts and schools choose the most appropriate reading programs to improve students' skills and performance? What information and assistance would be useful?
Should states promote particular reading programs for districts and schools to use?
How can a reading program's track record be checked and validated?
What criteria should states and districts use to invest in various reading programs initially and for the long term?
How should policymakers weigh the benefits of a reading program versus its cost and required resources?
Can a balance be struck between effectiveness and efficiency?
What state policies can help improve teacher training and professional development so teachers are better equipped to help all students read successfully?

Resources:
Scientific Learning Corporation (1999, April). *National Field Trial Results: Results of Fast ForWord Training for Children with Language and Reading Problems.* Berkeley, CA: Scientific Learning Corporation

Miller, S.L.; Merzenich, M.M.; Tallal, P.; DeVivo, K.; LaRossa, K.; Linn, N.; Pycha, A.; Bolton, S.; Peterson, B.E.; and Jenkins, W.M. (1999). *Acoustically Modified Speech and Language Training Reduces Risk for Academic Failure.* Manuscript submitted for publication.

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